Chapter 6

Heart failure patients monitored with telemedicine: patient satisfaction, a review of the literature

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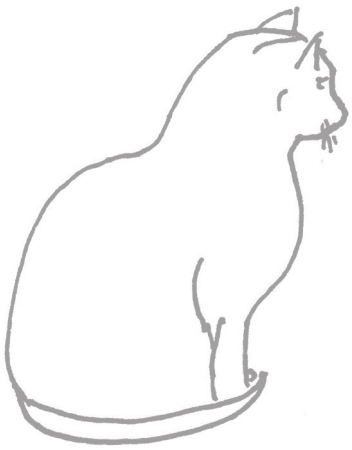

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Abstract

Background: Remote monitoring of the clinical status of heart failure patients has developed rapidly and is subject of several trials. Patient satisfaction is an important outcome, as recommended by the U.S. Food and Drug Administration to use in clinical research, and should be included in studies concerning remote monitoring. The objective of this review is to describe the current state of the literature on patient satisfaction with noninvasive telemedicine, regarding definition, measurement and overall level of patient satisfaction with telemedicine.

Methods and results: The Pubmed, Embase, Cochrane, and Cinahl databases were searched using heart failure-, satisfaction-, and telemedicine-related search terms. The literature search identified 193 publications, which were reviewed by 2 independent reviewers. Fourteen articles were included. None of the articles described a clear definition or concept of patient satisfaction with telemedicine. Patient satisfaction with telemedicine was measured with self-developed questionnaires or face-to-face or telephonic interviews. None of the articles used the same questionnaire or telephonic survey to measure patient satisfaction. Only one questionnaire was assessed for validity and reliability. In general, patients seemed to be satisfied or very satisfied with the use of telemedicine.

Conclusions: Measurement of patient satisfaction is still under-exposed in telemedicine research and the measurement of patient satisfaction with telemedicine underappreciated with poorly constructed questionnaires.

Introduction

Heart Failure (HF) is a chronic condition characterized by periods of worsening symptoms and signs which may require hospitalization and frequent doctor visits.[1] Telemedicine offers a modern and emerging concept to monitor patients with HF at home and can be seen as a process of remote interpretation of the clinical status of a patient.[2] In the current discussion on optimal disease management of HF programs,[3] telemedicine might be a valuable addition.[4] During the past 10 years, remote monitoring using telephone support or patient initiated electronic monitoring has developed rapidly.[2] Different types of telemedicine interventions have been developed, such as invasive and non-invasive telemedicine, telemedicine with or without peripheral devices and video consultation with or without peripheral devices.[2,5] Telemedicine is also available in a diversity of other settings, with chronic diseases such as chronic obstructive pulmonary disease (COPD), dermatology, and psychiatry. Frequent monitoring and interpretation of the clinical status of a patient by a health care professional has been shown to enable earlier intervention to treat deterioration.[2] More importantly, telemedicine reduces the risk of all-cause mortality and hospitalization in patients with HF.[6]

In the past 10 years, most telemedicine research has had a technologic focus aimed at acquiring knowledge regarding bandwidths and resolution.[7] Patient-reported outcomes such as patient satisfaction emerged at that time as a byproduct of the growing number of trials and pilot studies.[8] Now the use of patient-reported outcomes is considered to be important for several reasons. First, the U.S. Food and Drug Administration (FDA) recently released guidance for the use of patient-reported measurements in medical product development to support labeling claims of medical products.[9] The basic principles propagated by the FDA are relevant for other areas of research as well.[10] Second, patient satisfaction is increasingly considered to be an indicator of quality of care.[11,12] In terms of cost-benefit aspects, satisfied patients have fewer complaints, fewer second opinions and fewer repeated investigations.[11] Furthermore, it is suggested that satisfaction is related to patients' adherence to medical treatment regimens.[13-15] Measurement and understanding of patient satisfaction is therefore a requisite for the successful treatment of HF.

Within the medical literature, patient satisfaction can be seen as a hierarchic structure with 3 levels: The broadest level is satisfaction with health care delivery, the

middle level represents treatment satisfaction, and satisfaction with medication or medical device is at the narrowest end of the hierarchy.[15] The broadest level of patient satisfaction includes issues of accessibility, patient-physician interaction and perceived quality of staff and facilities.[15] These issues of patient satisfaction are important in telemedicine research as well. Ware et al. (1983)[16] described patient satisfaction as a multi-dimensional concept consisting of 8 dimensions: interpersonal manner, technical quality of care, accessibility or convenience, finances, efficacy or outcomes of care, continuity, physical environment and availability. These 8 dimensions represent the different domains of patient satisfaction with providers and medical services. In addition to a theoretic foundation, it is important to use a standardized method for measuring patient satisfaction with validated measurement tools as recommended by the FDA.[9] The aim of the present review was to describe the current literature regarding research on patients' satisfaction with telemedicine, based on the following questions: 1) How is the concept of patients' satisfaction with telemedicine defined? 2) How is patients' satisfaction with telemedicine measured? and 3). What is the overall level of patients' satisfaction with telemedicine?

Methods

Search strategy

A comprehensive search was conducted through the Pubmed, Embase, Cinahl, and Cochrane databases of medical literature published until November 2010 with a customized search strategy for each database. The search strategy consisted of heart failure-, satisfaction-, and telemedicine-related search terms. To avoid missing relevant literature, the search was made as broad as possible by using the explode function (*Table* 1).

Selection of articles

The literature search identified 193 potential relevant publications in Pubmed (n = 47), Embase (n = 39), Cinahl (n = 70), and Cochrane (n = 37). Forty-six articles were simultaneously present in > 1 database. To be included in the present review, publications were assessed by 2 independent reviewers using the following inclusion criteria: Articles had to: 1) describe original studies; 2) describe studies performed in patients with HF; 3) be published in peer-reviewed journals; 4) be published in English; 5) measure patient

satisfaction with telemedicine; and 6) describe studies with noninvasive remote monitoring with external equipment to measure physiological data such as weight and blood pressure. As a result, 133 articles were excluded: 72 articles were not original studies (reviews, meta-analysis, editorials, and commentaries); 2 articles did not involve HF patients; 1 article was not in English; 8 articles were not published in peer-reviewed journals, and 38 articles did not use noninvasive remote monitoring with external equipment; and 12 articles did not measure patient satisfaction with telemedicine. One article did not use the term satisfaction; however, a questionnaire that consisted of elements of satisfaction was used to measure the acceptance of a telemedicine device and it was therefore included. A third reviewer settled any disagreement between the 2 reviewers. *Figure* 1 shows the flowchart of inclusion.

Assessment of articles

Because the heterogeneous nature of the studies precluded formal statistical techniques such as meta-analysis, the articles were examined using qualitative analysis. The multidimensional definition of satisfaction defined by Ware et al[16] was used to assess the definition and measurement of patient satisfaction. The dimensions within this definition are considered to be stepping stones and were therefore slightly adapted to make it more specific to treatment of HF patients with telemedicine (*Table* 2).

Results

General findings

Fourteen articles were included in this review: 4 articles were randomized controlled trials,[17-20] 7 were pilot studies,[21-27] and the other articles were an observational study,[28] an evaluation study,[29] and an efficacy study.[30] Eight studies included patients with other diseases in addition to HF, such as patients with COPD, diabetes, hypertension, and angina.[17-20,22,25,28,29] The studies used different forms of telemedicine: 6 studies used telemedicine with video equipment,[17-20,22,25] and the other studies did not use direct communication devices.[21,23,24,26-30] Patients received the telemedicine intervention as a clinical study in the home care setting after hospital discharge,[17-19,21,26,27] by referral to home health care,[20,28] or after attending an outpatient clinic.[23,29] The intervention period varied

across studies, from 1 to 6 months. In 2 studies, the intervention period depended on the duration of the home care services. Characteristics of the included articles are presented in *Table* 3.

How was patients' satisfaction with telemedicine described?

None of the included articles gave a formal description or definition of the concept of patient satisfaction with telemedicine. The terms patient satisfaction and patient perception were used in the various articles as synonyms.[18,20,26,27] The meaning or content of patient satisfaction in the different articles had to be derived from the way that patient satisfaction was measured. With the 8 dimensions described by Ware et al[16] as a reference, none of the articles used all dimensions in their questionnaires to measure patient satisfaction (*Table* 4).

In general, 11 articles[18,20,22-30] used the dimension "efficacy or outcomes of care," describing the result of the remote monitoring of the patient in terms of, eg, health status, self-care, and self-management. The dimension "physical environment" was used in 11 articles,[17-22,26-30] describing the features of the telemedicine equipment such as characteristics of the equipment relating to its operation, privacy, and security. None of the articles used the dimension "continuity".

Of the 6 articles that exclusively included patients with HF,[21,23,24,26,27,30] Whitten et al (2009)[26] and Nanevicz et al (2000)[23] used, respectively, 6 and 5 dimensions to measure patient satisfaction. The other articles used 3[30] or fewer[21,24,27] dimensions. The dimensions "efficacy of care," "physical environment," and "availability" were used more often in the articles exclusively regarding HF patients, and the dimensions were more specifically related to patients with HF. For example, the dimension "efficacy of care" was used in terms of self-care regarding understanding of important symptoms and adherence to medication and diet.

How was patient satisfaction with telemedicine measured?

Patient satisfaction with telemedicine was measured with self-developed questionnaires and face-to-face or telephonic interviews (*Table* 5). None of the articles used the same questionnaire or telephonic survey. The development of one questionnaire, the Telemedicine Perception Questionnaire (TMPQ) used by Finkelstein et al (2004),[20] was documented and described in a separate publication.[31] This questionnaire was tested for

validity and reliability, resulting in a questionnaire with 17 items and a score theoretically ranging from 17 to 85.[31] The tool used by Kulshreshtha et al (2010)[27] consisted of questions from different questionnaires, including the TMPQ. Their final survey tool was tested during the design phase of the study, but the authors did not describe which form of testing was performed. Furthermore, the survey was not validated or checked for reliability.[27] The other 12 articles did not reveal any information regarding development and validation of the used questionnaire.[17-19,21-26,28-30]

The questionnaires and telephonic surveys differed in the number of questions: 6 articles used ≥ 10 questions,[17,20,23,26,29,30] 4 articles 5-9 questions,[18,19,21,28] and 3 articles ≤ 3 questions.[22,24,25] One article did not describe the number of questions or type of answering scale.[27] Most of the articles used a Likert type answering scale.[18-21,23,24,26,28-30] Results of the questionnaires were described in 2 ways: with a total score[17,20,21] or with a score for each question[18,19,22-26,28-30] (*Table* 5).

What was the overall level of patients' satisfaction with telemedicine?

In general, patients were very satisfied[17-19,22,27,28,32] or satisfied[20,21,23,25,26,30] with the telemedicine intervention they received. This is presented in *Table* 5. Two articles[17,20] measured patient satisfaction at different moments in time, resulting in a higher score at posttest compared with pretest measurement. Finkelstein et al[20] measured patient satisfaction at the start of the study and after 1 month, and the pretest score was significantly lower than the posttest score: 57.8 and 63.9, respectively ($P < 0.0001$). Woodend et al.[17] measured patient satisfaction at 1, 2, and 3 months of monitoring, with mean scores of 92, 92, and 97, respectively. The scores could theoretically range from 0 to 100; statistical differences between time periods were not described. The total score on the questionnaire used in the articles of Baer et al[21] and Woodend et al[17] were near the maximum possible score. Most of the articles that described the score per component of the questionnaires gave high component scores, except for Whitten et al.[26]

Discussion

This systematic review focuses on patients' satisfaction with noninvasive telemedicine in heart failure. The definition of patients' satisfaction was poorly described and measured in many different ways with poorly constructed instruments. The literature search yielded 14 articles, in which it seemed that patients were very satisfied with telemedicine.

The recommendation of the FDA to use a theoretical foundation and standardized validated instruments[9] was not observed in the reviewed articles. The multi-dimensional concept of Ware et al (1983)[16] can be suitable, because it consists of 8 domains which represent all aspects of patient satisfaction with providers and medical services. No standardized instruments were used to measure patient satisfaction in the 14 reviewed articles. Only 1 instrument, the Telemedicine Perception Questionnaire (TMPQ), used by Finkelstein et al. (2004)[20] measured patient satisfaction with 7 of the domains of Ware et al. Only the dimension "continuity of care" was not measured with the TMPQ. In the other reviewed articles, aspects concerning the continuity of care and finances were generally underexposed. The dimensions regarding efficacy or outcomes of care and physical environment were represented in most of the instruments, which emphasizes that outcome of treatment as well as technological aspects are still identified as important by the authors. It was also reflected in the fact that none of the articles had patient satisfaction as their primary research question. This indicates that the recommendation of the FDA to use patient-reported outcomes in clinical research is not implemented in telemedicine research at the moment. Moreover, the recommendation to use standardized and validated instruments for the measurement of patient-reported outcomes also was not fulfilled. The TMPQ was the only questionnaire that had undergone a formal developmental process which was documented and tested for face, content, and construct validity. The reliability of the TMPQ was investigated and documented as well.[31] The adequacy of an instrument to measure a patient-reported outcome depends on, besides a conceptual framework, several measurement properties. The FDA examines the following measurement properties in their review of instruments regarding patient-reported outcomes: reliability regarding test-retest, ability to detect change, and validity regarding content and construct validity. The measurement properties considered in the TMPQ are in line with this recommendation of the FDA regarding the measurement of a patient-reported outcome.[9] Viewed from this

point, it seems that the TMPQ is the only appropriate measurement that can be used to assess patient satisfaction in telemedicine research. However, viewed from the multidimensional concept of Ware et al, [16] the dimension regarding the "continuity of care" should be added to the TMPQ.

Overall, the studies reported that patients were satisfied or very satisfied with the use of noninvasive telemedicine. However, the value of these high satisfaction levels is questionable and might be overestimated. In patient satisfaction research this is a well known phenomenon which is mostly due to a combination of methodologically poorly developed questionnaires, response bias, and, in the case of telemedicine research, inclusion bias of patients. Moreover, the included studies in this review were very heterogeneous regarding study design, study population and type of telemedicine. The search strategy was not limited to randomized controlled studies and thus observational studies and pilot studies were included. Eight studies included patients with other diseases besides HF, such as patients with COPD, hypertension, diabetes, and angina. It was not possible to adapt the results of these studies to HF patients only. The design of the studies varied significantly as well: patients received the telemedicine intervention as a clinical study in the home care setting after hospital discharge, by referral to home health care or after attending an outpatient clinic.

Conclusion

The results of this systematic review indicate that the measurement of patient-reported outcomes such as patient satisfaction with noninvasive telemedicine in HF patients is still underexposed. Only a small amount of studies regarding patient satisfaction was found. The concept of patient satisfaction was poorly defined, and well developed and validated instruments were scarcely available. Because the measurement of patient satisfaction is recommended by the FDA, and because patient satisfaction is more and more considered to be an important component of the quality of health care; it is strongly recommended that patient satisfaction become more prominent in telemedicine research and that well designed, validated, and standardized instruments with theoretic foundation be used to measure patient satisfaction with telemedicine in the future.

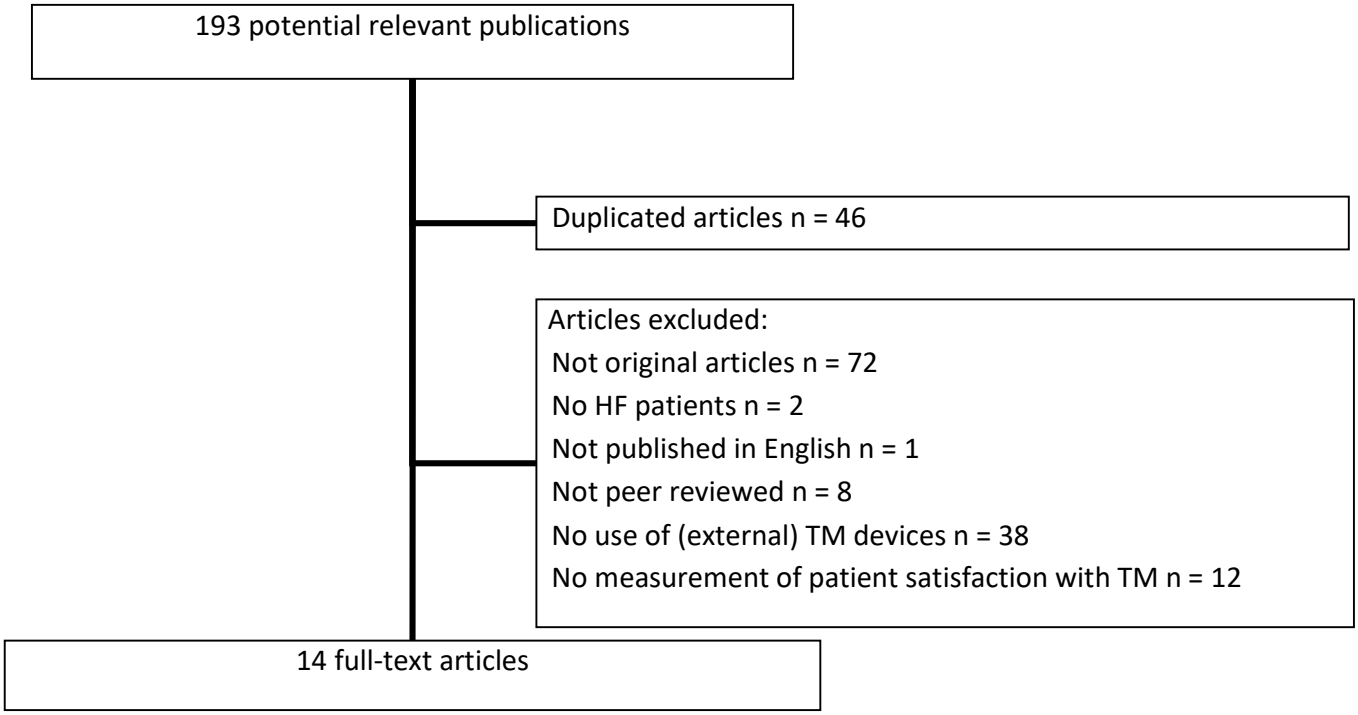

Figure 1: Flowchart of inclusion in the study. HF = heart failure; TM = telemedicine.

Table 1. Bibliographic search strategy

Database	**Access date**	**Search strategy**	**No of articles**
Pubmed	Sept 11,2010	("Heart Failure"[Mesh] OR "heart failure") AND (telecare OR telehealth OR telehomecare OR "Telecommunications"[Mesh] OR "remote patient monitoring" OR "remote monitoring" OR telemedic* OR telemonit*) AND ("Patient Satisfaction"[Mesh] OR "satisfaction" OR "satisfied" OR "ease of use" OR perception*) Limits: English	47
Embase	Sept 11,2010	'heart failure'/exp OR 'heart failure' AND ('telehealth' OR 'telehealth'/exp OR telehealth OR telemomecare OR telecare OR 'telecommunications' OR 'telecommunications'/exp OR telecommunications OR 'telemedicine' OR 'telemedicine'/exp OR telemedicine OR 'remote patient monitoring' OR 'remote monitoring' OR telemedic* OR telemonit*) AND ('patient satisfaction'/exp OR 'patient satisfaction' OR 'satisfaction'/exp OR satisfaction OR satisfied OR 'ease of use' OR perception*) AND [embase]/lim AND [english]/lim	39
Cinahl	Sept 11,2010	((MH "Telecommunications+") OR (TX telecare OR telehealth OR telehomecare OR telecommunication OR "remote patient monitoring" OR "remote monitoring" OR telemedic* OR telemonit*) AND (MH "Heart failure, Congestive+") OR TX "Heart failure") AND (MH "patient satisfaction") OR (TX satisfaction OR satisfied OR "ease of use" OR perception*)	70
Cochrane	Sept 11,2010	(Telecommunications [Mesh] OR (telecare OR telehealth OR telehomecare or "remote patient monitoring" OR "remote monitoring" OR telemedic* OR telemonit*)) AND ("Heart failure [Mesh] OR heart failure) AND (patient satisfaction [Mesh] OR (satisfaction OR satisfied OR "ease of use" OR perception*))	37

Table 2: Dimensions of patient satisfaction with brief definition

Dimension of patient satisfaction	Definition as described by Ware et al.	Definition adapted specific for treatment with telemedicine
Interpersonal manner	Features of the way in which providers interact personally with patients	Features of the way in which providers interact personally with patients remotely
Technical quality	Competence of providers and adherence to high standards of diagnosis and treatment	Competence of providers to assess and treat the signs and symptoms of patients remotely
Accessibility/ convenience	Factors involved in arranging to receive medical care	Factors involved in arranging to receive medical care by means of the telemedicine equipment
Finances	Factors involved in paying for medical services	Factors involved in paying for the use of telemedicine equipment.
Efficacy/ outcomes	The results of medical care encounters	Result of the remote monitoring of the patient with telemedicine
Continuity	Sameness of provider and/ or location of care	Continuity of care when the patient is in contact with a healthcare provider remotely
Physical environment	Features of setting in which care is delivered	Features of the telemedicine equipment such as operating procedures, comfort.
Availability	Presence of medical care resources	Presence of telemedicine equipment

Note:

The dimensions and definitions are adapted from Ware et al.[16]

Table 3: characteristics of the included studies

Study (first author)	N	Age	Patients were diagnosed with:	Video phone	Duration of intervention	Control group	Remarks
Baer et al. 1999	28	69	CHF	No	5 mth	No	Pilot study
Cardozo et al. 2010	851	60 +	HF, HT, COPD, DM	No	60 days	No	Observational study; 1-3 times per week in home visits by nurse
Finkelstein et al. 2004	68	74.3	CHF, COPD, chronic wound care	Yes*	***	Yes (n = 19)	Randomized controlled trial; 3 groups: video, remote monitoring and control
Johnston et al. 2000	102	71	CHF, COPD, CVA, cancer, DM, wound care, secondary diagnosis of anxiety	Yes	Mean 53 days	Yes (n = 110)	Randomized study; Intervention was video visits in addition to in-person and telephone visits.
Kobb et al. 2003	281	72	HT, HF, CAD, DM and emphysema	Yes	***	Yes (n = 1120)	Pilot study
Kulshreshtha et al. 2010	150	70/ 66**	HF	No	6 mth	Yes (n = 68)	Pilot study
Nanevicz et al. 2000	50	60	CHF	No	30 days	No	Pilot study
Nobel et al. 2000	52		CHF	No	***	No	Pilot study
Scherr et al. 2006	20	50	CHF, HT	No	90 days	No	Evaluation study
Seibert et al. 2008	13	66/ 71**	CHF	No	6 wk	Yes (n = 10)	Efficacy study
Walsh et al. 2005	8		Heart disease, DM	Yes	2 mth	No	Pilot study
Whitten et al. 2007	83	76	CHF, COPD	Yes*	Mean 10.7 wks	Yes (n = 78)	Randomized study
Whitten et al. 2009	50	78	CHF	No	60 days	No	Pilot study
Woodend et al. 2008	249	66	HF, angina	Yes*	3 mth	Yes (n = 125)	Randomized controlled trial

Note: HT = hypertension, HF = heart failure, CHF = congestive HF, CAD = coronary artery disease, DM = diabetes; wk = weeks; mth = months

* Finkelstein et al. 2004 twice a week videophone contact; Whitten et al. 2007 and Woodend et al. 2008 weekly videophone contact, **age: intervention vs control group,

*** (exact) duration of intervention was not reported.

Table 4: questions in questionnaires plotted against the domains of patient satisfaction

Author	Interpersonal manner	Technical quality of care	Accessibility or convenience	Finances	Efficacy or outcomes of care	Continuity	Physical environment	Availability
Finkelstein et al., 2004	x	x	x	x	x	-	x	x
Whitten et al., 2009	x	x	x	-	x	-	x	x
Whitten et al., 2007	x	x	-	-	x	-	x	x
Scherr et al., 2006	-	-	x	x	x	-	x	x
Nanevicz et al., 2000	x	x	x	-	x	-	-	x
Cardozo et al., 2010	-	x	-	-	x	-	x	x
Johnston et al., 2000	x	x	x	-	-	-	x	-
Seibert et al., 2008	-	-	-	-	x	-	x	x
Kobb et al., 2003	-	-	-	-	x	-	x	x
Walsh et al., 2005	-	-	-	-	x	-	-	x
Nobel et al., 2000	-	-	-	-	x	-	-	-
Kulshreshtha et al. 2010	-	-	-	-	x	-	x	-
Woodend et al., 2008	-	-	-	-	-	-	x	-
Baer et al., 1999	-	-	-	-	-	-	x	-

Table 5: characteristics of the questionnaires

Author	Number of questions	Scale questionnaire	Validity assessed	Total score[1]	Score per component[2]	Result intervention group
Patient satisfaction with telemedicine measured with questionnaires						
Finkelstein et al., 2004	17	5 point Likert scale	Yes	x		57.8, 63.9 (pre- and posttest score) 57.8 and 63.9 (p< 0.0001)
Woodend et al., 2008	10	0-100	-	x		92, 92, 97 (1,2 and 3 months)
Baer et al., 1999	9	5 point Likert scale	-	x		3.76/ 4.3 3
Scherr et al., 2006	18	2-3 point Likert scale + open ended question	-		x	Acceptance of program was high
Whitten et al., 2009	17	7 point Likert scale	-		x	1.29-6.94
Nanevicz et al., 2000	12	3-5 point Likert scale	-		x	Overall level of satisfaction was 64%
Johnston et al., 2000	6	3 point Likert scale	-		x	93.4 – 98.3 % agree or strongly agreed
Cardozo et al., 2010	5	5 point Likert scale	-		x	88-95% agree/ strongly agree
Kulshreshtha et al., 2010	-	-	No		x	90-100% agreed
Patient satisfaction with telemedicine measured with (telephonic) interviews						
Whitten et al., 2009	10	Open ended	-	x		Patients appreciated TM for keeping on a regular schedule of monitoring vital signs
Whitten et al., 2007	8	5 point Likert scale + open ended questions	-	x	x	3.2-4.7 Overall, patients were very satisfied
Seibert et al., 2008 b	13	5 point Likert scale + open ended questions	-		x	45-85% agree/ strongly agree
Walsh et al., 2005	3	Yes/no	-		x	87.5 - 100% yes
Kobb et al., 2003	3	Yes/no	-		x	95-97% Yes
Nobel et al., 2000	2	4 point Likert scale	-		x	88-93% satisfied
Woodend et al., 2008	-	Open ended questions about liked and disliked TM aspects	-			Easy to use

Note:

1 total score: the overall score of the questionnaire (mean score)

2 describing each component: not all the questionnaires gave an overall score.

3 the article gave two mean scores in two areas

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